PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-266854
(43)Date of publication of application : 15.10.1996

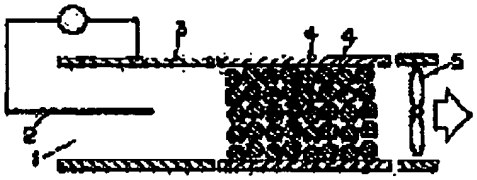
(51)Int.Cl. B01D 53/32
B01D 53/86

(21)Application number : 07-076991
(22)Date of filing : 31.03.1995

(71)Applicant : MATSUSHITA ELECTRIC WORKS LTD
(72)Inventor : YAMAUCHI TOSHIYUKI
TANAKA YOSHIMASA
KAWAMURA TADAO

(54) DEODORIZING DEVICE

(57)Abstract:
PURPOSE: To provide a deodorizing device high in deodorizing ability and also having dust removing ability.
CONSTITUTION: A discharge part 1 having a discharge electrode 2 executing discharge by a high voltage impressing and a counter electrode 3 is provided. A functional material 4 executing an adsorptive decomposition of a gas component using at least one among ozone, heat and UV rays generated by the discharge is provided. A bad smell component is decomposed electrochemically by a discharge phenomenon such as corona discharge or plasma discharge at the discharge part 1. The bad smell component which is not decomposed by the discharge is adsorbed and decomposed with the functional material 4 executing the adsorptive decomposition of the gas component by using at least one among ozone, heat and UV rays generated by the discharging. Since dust is ionized by the discharge. the dust is collected to the counter electrode 3 at the discharge part 1.



LEGAL STATUS

[Date of request for examination] 10.12.2001
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]

(19)日本国特許庁（JP） (12)公開特許公報（A） (11)特許出願公開番号

特開平8－266854

(43)公開日 平成8年(1996)10月15日

(51)Int.Cl.*		識別記号	庁内整理番号	FI		技術表示箇所
B01D	53/32	ZAB		B01D	53/32	ZAB
	53/86	ZAB			53/36	ZABH

審査請求 未請求 請求項の数22 OL (全 9 頁)

(21)出願番号 特願平7－76991

(22)出願日 平成7年(1995)3月31日

(71)出願人 000005832
松下電工株式会社
大阪府門真市大字門真1048番地

(72)発明者 山内 俊幸
大阪府門真市大字門真1048番地松下電工株式会社内

(72)発明者 田中 義昌
大阪府門真市大字門真1048番地松下電工株式会社内

(72)発明者 河村 忠勇
大阪府門真市大字門真1048番地松下電工株式会社内

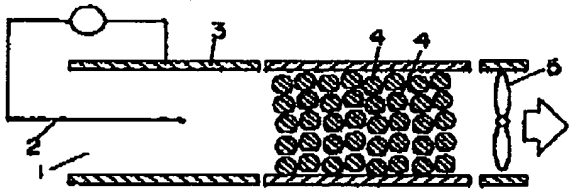
(74)代理人 弁理士 石田 長七 (外2名)

(54)【発明の名称】 消臭装置

(57)【要約】

【目的】 消臭能力がきわめて高い上に粉塵除去能力も備えている。

【構成】 高電圧印加により放電を行う放電極2と対極3とを有する放電部1を備える。放電によって生じるオゾン、熱、紫外線のうちの少なくとも一つを利用してガス成分の吸着分解を行う機能材料4を備える。放電部1におけるコロナ放電やプラズマ放電等の放電現象によって、臭気ガス成分を電気化学的に分解する。また放電によって分解されなかった臭気ガス成分は、上記放電によって生じるオゾン、熱、紫外線のうちの少なくとも一つを利用してガス成分の吸着分解を行う機能材料4によって吸着分解する。放電により粉塵はイオン化されるために放電部1における対極3に集塵される。



1 放電部
2 放電極
3 対極
4 機能材料

側に配設しても、放電部の放電空間中に配設してもよい。後者の場合、放電部の電極で囲まれている放電空間中に充填して配設することができ、この時の機能材料には粒状のものが好適であり、またチタン酸バリウム等の強誘電体材料が配合もしくは混合されていることが好ましい。

【０００７】機能材料は放電部の放電空間を囲む電極内壁に被覆して配設してもよく、この場合、電極内壁の機能材料による被覆層がその表面に凹凸を有していることが好ましい。電極内壁の一部に被覆し、電極の露出面を残すようにすることも好ましい。機能材料は放電部の電極で囲まれている放電空間中に充填するとともに放電部の放電空間を囲む電極内壁に被覆して配設するものであってもよい。

【０００８】さらに、機能材料は脱臭分解触媒であることが好ましく、この場合、オゾン脱臭触媒、燃焼酸化触媒、光触媒のいずれか、あるいはこれらのうちの少なくとも２種の組み合わせを用いることができる。機能材料は多孔質セラミック、活性炭、ゼオライト、粘土等の吸着材であってもよく、吸着材と脱臭分解触媒との組み合わせであってもよい。複数種の機能材料を直列に配設してもよい。

【０００９】放電部の放電空間を囲む電極は、ハニカム構造、網目構造もしくはロール状構造、あるいは円筒状とすることが好ましい。

【００１０】

【作用】本発明によれば、放電部におけるコロナ放電やプラズマ放電等の放電現象によって、大気ガス成分が電気化学的に分解されるものであり、そして放電によって分解されなかった大気ガス成分は、上記放電によって生じるオゾン、熱、紫外線のうちの少なくとも一つを利用してガス成分の吸着分解を行う機能材料によって吸着分解される。しかも放電により粉塵はイオン化されるために放電部における対極に捕集される。

【００１１】放電部の放電空間および機能材料の配置空間に空気を供給する送風装置を備えているならば、送風装置による積極的な空気導入により処理量を高めることができる。上記機能材料は、放電部の放電空間の下流側に配設してもよいが、放電部の放電空間中に配設した場合、機能材料によって吸着保持された大気ガス成分がその後の放電現象によって分解されるために、処理能力が高くなる。この場合、機能材料は放電部の電極で囲まれている放電空間中に充填して配設することで多くの機能材料を配設することができるが、粒状とすることで、放電の維持と、オゾン、熱、紫外線のうちの少なくとも一つを利用したガス成分の吸着分解を粒子間の隙間で高効率で行わせることができる。またチタン酸バリウム等の強誘電体材料が配合もしくは混合された機能材料を用いると、放電現象を促進させることができる。

【００１２】機能材料は放電部の放電空間を囲む電極内

壁に被覆して配設してもよく、この場合、圧力損失の低減を図ることができる。また、電極内壁の機能材料による被覆層がその表面に凹凸を有しているものである時、空気流に乱流を起こさせることができるために効率の良いガス除去反応を望むことができる。電極内壁の一部に被覆し、電極の露出面を残すと、放電現象の維持を図ることができる。

【００１３】放電部の電極で囲まれている放電空間中に機能材料を充填するとともに放電部の放電空間を囲む電極内壁に機能材料を被覆するようにしてもよい。そして機能材料として、オゾン脱臭触媒または燃焼酸化触媒または光触媒のいずれか、あるいはこれらの組み合わせからなる脱臭分解触媒を用いる時には、高いガス除去能力を有するものとすることができる。機能材料は多孔質セラミック、活性炭、ゼオライト、粘土等の吸着材であってもよく、この時には広範囲のガス成分の吸着を行うことができる。吸着材と脱臭分解触媒との組み合わせで機能材料を構成した時には、上記両種の機能材料による各効果を期待することができ、更に複数種の機能材料を直列に配設した時には、各機能材料の特徴を夫々利用してガス成分の除去を行うことができるものとなる。

【００１４】放電部の放電空間を囲む電極は、ハニカム構造とした時、放電効率の向上を図ることができるとともに占有スペースに比して処理能力の高いものとすることができる。網目構造もしくはロール状構造としてもやはり占有スペースに比して処理能力の高いものとすることができ、更に円筒状とした時には機能材料を放電空間内に配設するにあたり、多くの機能材料を配設することができる。

【００１５】

【実施例】以下本発明を図示の実施例に基づいて詳述すると、図１あるいは図２において、図中１は放電極２と対極３からなる放電部を示し、３は放電部における放電によって生じるオゾン、熱、紫外線のうちの少なくとも一つを利用してガス成分の吸着分解を行う機能材料を示している。上記放電部１は、高電圧の印加によって放電極２と対極３との間でコロナ放電やプラズマ放電等の放電を生じさせるものであり、対極３は放電極２を囲む断面円形乃至多角形の筒状のものであることが好ましいが、平板状や網状のものであってもよい。放電極２は板状または網状であることが好ましい。これら放電極２及び対極３の材質は、導電性材料であれば何でもよいが、ステンレス、タングステン等を好適に用いることができる。放電極３を筒状とする場合、この放電極３で囲まれる空間の断面積は、０．０１～１００００mm^{2}のうちの任意のものを用いることができるが、放電性の点からは１～１００mm^{2}が望ましい。なお、放電部１の外部は、シリカ、アルミナ、コーディエライト等の無機物、あるいはアクリル樹脂、ＡＢＳ、ポリスチレン等の有機物からなる筐体で覆うことで安全性を確保するのが望

この場合の一部は、被覆率において１０％～９９％を意味する。機能材料４による被覆層の表面に、図４に示すように凹凸を設けておくと、通過する空気流に乱流を生じさせることができるために、効率の良いガス除去反応を望むことができるものとなる。

【００２５】図７に示すものは、対極３を筒体が列設されたハニカム形状のものとして形成し、各空間内の中央に放電極２を配置した放電部１を示している。筒体の断面形状は、六角形だけでなく、四角、三角、あるいは丸型のものであってもよい。このようにした場合、放電空間を小さくして放電効率の向上に有利であるほか、占有スペースに比して高い処理能力を発揮するものとなる。図１０は機能材料４を各セルの内面に被覆層として形成し、図１２はセルの内面の被覆層とするとともに放電空間に充填した場合を示している。

【００２６】図８に示すように、ロール状構造としたり積層構造としたりした時にも、占有スペースに比して処理能力の高いものとすることができる。図８(b)はロール状とされる対極３の片面に機能材料４の被覆層を設けた場合を示している。図９は対極３を円筒型としたものを示している。次に具体実施例と比較例とによって消臭能力について説明する。

●実施例１－１

内径３５ｍｍφ、長さ１８０ｍｍのステンレス製円筒状の対極３の中心に直径１ｍｍφ、長さ１２０ｍｍのタングステン線からなる放電極２を配置して放電部１を構成し、直流６ｋＶの電圧を印加することで放電を生じさせた。また放電部１の下流側に１２Ｖ駆動の送風装置４を、放電部１と送風装置４との間に内径３５ｍｍφ、長さ５０ｍｍのセラミック製円筒管を配してこの中に平均粒径３．５ｍｍの二酸化マンガンを表面に添着させたオゾン脱臭触媒を見かけで約５０ｃｃ充填した。

●実施例１－２

実施例１－１におけるオゾン脱臭触媒に代えて、平均粒径２ｍｍの燃焼酸化触媒を３０ｃｃと、平均粒径２ｍｍの粒状活性炭２０ｃｃとを混合したものを用いた。

●実施例２－１

内径２８ｍｍφ、長さ１５０ｍｍのステンレス製円筒状の対極３の中心に直径０．７ｍｍφ、長さ１００ｍｍのステンレス線からなる放電極２を配置して放電部１を構成し、交流１０ｋＶの電圧を印加することで放電を生じさせた。また対極３内に平均粒径２ｍｍのチタニア／シリカベースのオゾン脱臭触媒を約６０ｃｃ充填した。対極３の両端開口面にはガラス製不織布を配して脱臭触媒の漏れを防いだ。送風装置６は下流側に配置した。

●実施例２－２

実施例２－１におけるオゾン脱臭触媒に代えて、平均粒径約２ｍｍのチタニア／シリカベースの二酸化マンガンを含んだオゾン脱臭触媒約１０ｃｃと、平均粒径２ｍｍのチタン酸バリウム磁器（強誘電体）４０ｃｃとの混合物を用いた。また印加電圧は１２ｋＶとした。

●実施例２－３

実施例２－１におけるオゾン脱臭触媒に代えて、平均粒径約２ｍｍのチタニア／シリカベース＋二酸化マンガンとチタン酸バリウムが全体重量比で７０部となるように配合した平均粒径３ｍｍのオゾン脱臭触媒／チタン酸バリウム磁器を調整して混合した後６０ｃｃを充填した。また印加電圧は１２ｋＶとした。

【００２７】以上のものについて、風量１．０リットル／分の条件下で１０ｐｐｍのアンモニアガスを導入し、消臭装置下流側で検知管による濃度測定を行うことで、ガス除去率を求めた。ガス除去率は

ガス除去率（％）＝（導入濃度－下流濃度）×１００／導入濃度

で算出した。結果を表１に示す。なお、表中の比較例は各実施例について放電部１のみで消臭させた場合を示している。

【００２８】

【表１】

	アンモニアガス除去率（％）
実施例１-１	９８.５
比較例１-１	４０.３
実施例１-２	９９.６
比較例１-２	３８.５
実施例２-１	９８.４
比較例２-１	３２.６
実施例２-２	９９.３
比較例２-２	５０.１
実施例２-３	９９.７
比較例２-３	３９.６

【００２９】●実施例３－１

内径１０ｍｍ、長さ４５０ｍｍのステンレス製円筒状の対極３の中心に直径１．２ｍｍ、長さ１８０ｍｍのステンレス線からなる放電極２を配置して放電部１を構成し、交流１５ｋＶの電圧を印加することで放電を生じさせた。また対極３の内面にコーディエライトベースの二酸化マンガンを厚み２ｍｍでコーティングしてオゾン脱臭触媒の被覆層を形成した。この被覆層の表面はヤスリを用いて荒らすことで約１ｍｍの凹凸段差を設けた。送風装置６は下流側に配置した。

●実施例３－２

実施例３－１における放電極２を直径１．０ｍｍ、長さ１５０ｍｍのステンレス線で形成したものに代えるとともに、印加電圧を交流１１ｋＶとし、さらに対極３内面のオゾン脱臭触媒の被覆層の表面をヤスリを用いて荒らすことで約１ｍｍの凹凸段差を設けた。

●実施例３－３

実施例３－１における放電極２を直径１．４ｍｍ、長さ２００ｍｍのステンレス線で形成したものに代えるとと

０．５ｍｍの厚みでセル長さ方向１００ｍｍで形成した。また下流側にはセル内寸が約５ｍｍ角、長さ１００ｍｍのセル数２０のコーディエライト製のハニカム構造物のセル内面を白金ペーストで約０．２ｍｍのコーティングを行うことで対極３を構成し、この内面に二酸化マンガンを主触媒とするオゾン脱臭触媒層を形成した。なお、上記両対極３，３は電気的に接続した。上流側のセル内には、０．５ｍｍ×８０ｍｍのステンレス線からなる放電極２を各セルの中心に配置した。放電極２と対極３との間には交流１６ｋＶの電圧を印加した。送風装置は下流側に配置した。

●実施例６－３

図１１に示すように、セル内寸が約５ｍｍ角、長さ１００ｍｍのセル数２０のコーディエライト製のハニカム構造物のセル内面を白金ペーストで約０．２ｍｍのコーティングを行うことで対極３を構成し、さらにその内面に図５に示すような緻密となった機能材料（二酸化マンガン／チタン酸バリウム／無機材料を重量比で約３／３／４で配合したオゾン脱臭触媒／強誘電体層）を約０．２ｍｍの厚みでセル長さ方向１００ｍｍで形成した。また下流側にはセル内寸が約５ｍｍ角、長さ１００ｍｍのセル数２０のコーディエライト製のハニカム構造物のセル内面を白金ペーストで約０．２ｍｍのコーティングを行うことで対極３を構成し、この内面に上記機能材料とは別の種類の機能材料（二酸化マンガン、白金等を主成分とした燃焼酸化触媒）をコーティングした。なお、上記両対極３，３は電気的に接続した。上流側のセル内には、０．５ｍｍ×８０ｍｍのステンレス線からなる放電極２を各セルの中心に配置した。放電極２と対極３との間には交流１５ｋＶの電圧を印加した。送風装置は下流側に配置した。

●実施例６－４

実施例６－３における上流側の機能材料として、二酸化マンガン／活性炭／無機材料を重量比で約５／３／２の割合で配合したオゾン脱臭触媒／吸着層を用い、下流側の機能材料として、活性炭を主成分とする吸着材を用いた。

【００３６】これら実施例６－１～６－４について、風量１．６リットル／分の条件下で煙草（マイルドセブン）２本を燃焼させて副流煙を導入し、消臭装置下流側で正常な嗅覚をもつパネラー１０人による官能試験を行った。評価法は６段階臭気強度表示法（０：無臭，１：かすかに感じる、２：やや強く感じる、３：強く感じる、４：非常に強く感じる、５：極端に強く感ずる）に基づいて実施した。また同時にオゾン濃度ならびにマイナスイオン濃度も計測した。結果を表４に示す。なお、表中の比較例は各実施例について放電部１のみで消臭させた場合を示している。

【００３７】

【表４】

	官能試験（平均値）	オゾン濃度（ｐｐｍ）	マイナスイオン濃度（個／CC）
実施例６-１	０．３	０．０	１２０００
比較例６-１	２．５	０．３	１０５００
実施例６-２	０．２	０．０	１３０００
比較例６-２	３．１	０．４	１０９００
実施例６-３	０．４	０．０	１２５００
実施例６-４	０．１	０．０	１２０００
比較例６-３，４	４．０	０．２	１００００

【００３８】●実施例７－１

０．１ｍｍのポリエステル層の両側に対極となるアルミニウム層を０．０５ｍｍ厚でコーティングしたものを直径が約５０ｍｍ，長さ方向が約１００ｍｍのスクロール型とし、内外層内に０．５ｍｍ×８０ｍｍのタングステン線からなる放電極を約２５ｍｍ間隔で配置した。また平均粒径約１，５ｍｍのチタン酸バリウム磁器粒子を放電空間内に配置した。スクロール両端には粒子の漏れを防ぐためにガラスファイバー製の不織布を配置し、送風装置は下流側に配置した。

●実施例７－２

実施例７－１における放電空間内に平均粒径約２．０ｍｍのオゾン脱臭触媒粒子を配置した。

●実施例７－３

実施例７－１における放電空間内に平均粒径約１．８ｍｍの活性炭／オゾン脱臭触媒粒子を３／５の混合比で混ぜて配置した。

【００３９】これら実施例７－１～７－３について、風量１．３リットル／分の条件下で煙草（マイルドセブン）２本を燃焼させて副流煙を導入し、消臭装置下流側で正常な嗅覚をもつパネラー１０人による官能試験を行った。評価法は前述の６段階臭気強度表示法に基づいて実施した。結果を表５に示す。なお、表中の比較例は各実施例について放電部１のみで消臭させた場合を示している。

【００４０】

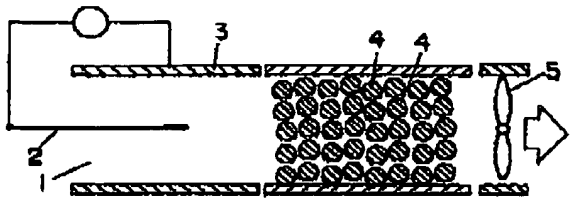
【表５】

	官能試験（平均値）
実施例７-１	０．２
実施例７-２	０．３
実施例７-３	０．３
比較例７	４．０

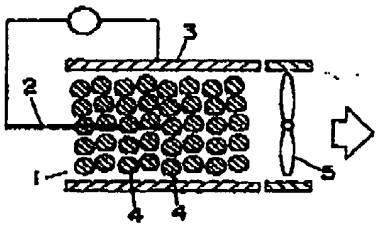
【００４１】

【発明の効果】以上のように本発明においては、放電部におけるコロナ放電やプラズマ放電等の放電現象によって、臭気ガス成分が電気化学的に分解されるものであり、そして放電によって分解されなかった臭気ガス成分

【図１】

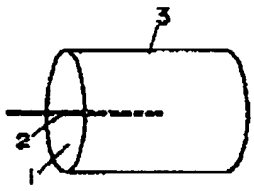


【図２】

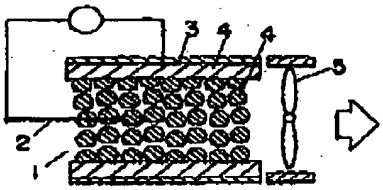


1 放電極
2 放電線
3 対極
4 誘電材料

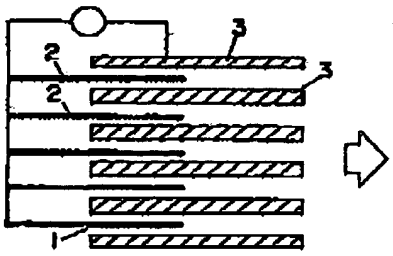
【図９】



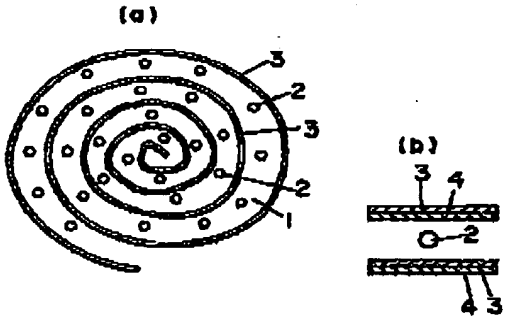
【図６】



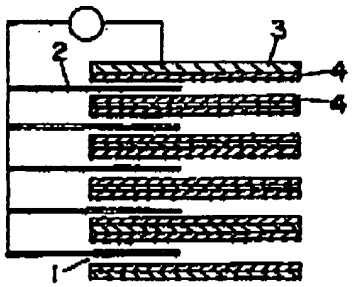
【図７】



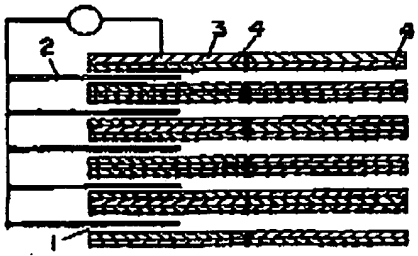
【図８】



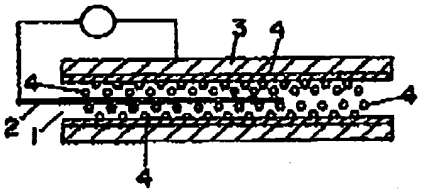
【図１０】



【図１１】



【図１２】



* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The ozone produced by discharge in the discharge section while having the discharge section which has the discharge electrode which discharges by high-voltage impression, and a counter electrode, heat, deodorization equipment characterized by having the functional material which performs adsorption decomposition of gas constituents using at least one of ultraviolet rays.
[Claim 2] Deodorization equipment according to claim 1 characterized by having ventilation equipment which supplies air to the discharge space of the discharge section, and the configuration space of a functional material.
[Claim 3] A functional material is deodorization equipment according to claim 1 or 2 characterized by being arranged in the downstream of the discharge space of the discharge section.
[Claim 4] A functional material is deodorization equipment according to claim 1 or 2 characterized by being arranged in throughout [discharge sky / of the discharge section].
[Claim 5] A functional material is deodorization equipment according to claim 4 characterized by filling up throughout [discharge sky / which is surrounded with the electrode of the discharge section].
[Claim 6] A functional material is deodorization equipment according to claim 5 characterized by the granular thing.
[Claim 7] Deodorization equipment according to claim 5 characterized by ferroelectric ingredients, such as barium titanate, being blended or mixed by the functional material.
[Claim 8] A functional material is deodorization equipment according to claim 4 characterized by being covered by the electrode wall surrounding the discharge space of the discharge section.
[Claim 9] The enveloping layer by the functional material of an electrode wall is deodorization equipment according to claim 8 characterized by having irregularity on the front face.
[Claim 10] A functional material is deodorization equipment according to claim 8 characterized by being covered by some electrode walls.
[Claim 11] A functional material is deodorization equipment according to claim 1 characterized by being covered by the electrode wall surrounding discharge space while throughout [discharge sky / which is surrounded with the electrode of the discharge section] is filled up.
[Claim 12] A functional material is deodorization equipment according to claim 1 characterized by being a deordorization decomposition catalyst.
[Claim 13] A deordorization decomposition catalyst is deodorization equipment according to claim 12 characterized by being an ozone deodorization catalyst.
[Claim 14] A deordorization decomposition catalyst is deodorization equipment according to claim 12 characterized by being a combustion oxidation catalyst.
[Claim 15] A deordorization decomposition catalyst is deodorization equipment according to claim 12 characterized by being a photocatalyst.
[Claim 16] A deordorization decomposition catalyst is deodorization equipment according to claim 12 characterized by being at least two sorts of combination of an ozone deodorization catalyst, a combustion oxidation catalyst, and the photocatalysts.

PAGE 28/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

[Claim 17] A functional material is deodorization equipment according to claim 1 characterized by being adsorption material, such as a porosity ceramic, activated carbon, a zeolite, and clay.
[Claim 18] A functional material is deodorization equipment according to claim 1 characterized by being the combination of adsorption material, such as a porosity ceramic, activated carbon, a zeolite, and clay, and a deordorization decomposition catalyst.
[Claim 19] Deodorization equipment according to claim 1 characterized by two or more sorts of functional materials being arranged by the serial.
[Claim 20] Deodorization equipment according to claim 1 characterized by the electrode surrounding the discharge space of the discharge section being honeycomb structure.
[Claim 21] Deodorization equipment according to claim 1 characterized by the electrode surrounding the discharge space of the discharge section being a laminated structure or roll-like structure.
[Claim 22] Deodorization equipment according to claim 1 characterized by the electrode surrounding the discharge space of the discharge section being cylindrical.

[Translation done.]

PAGE 29/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to removal of the odor gas constituents in a gas, and the deodorization equipment which can also remove dust further.
[0002]
[Description of the Prior Art] As deodorization equipment from which the odor gas in a gas is removed, although there is a thing based on wet methods, such as a scrubber soil odor treatment, since this serves as large-scale equipment, by the general thing for home use, physical or the thing to depend on the dry process using deordorization decomposition catalysts, such as the approach of carrying out adsorption treatment with a chemical adsorption process or an ozone deodorization catalyst, a photocatalyst, and a combustion oxidation catalyst, is usually used. Moreover, the electrostatic precipitator is used as a thing for removing the dust of the shape of tar by the cigarette in air.
[0003]
[Problem(s) to be Solved by the Invention] The deodorization capacity of conventional deodorization equipment is low, and it cannot remove the odor gas constituents of the amount needed by the one pass. Moreover, in performing dust removal to coincidence, since it does not have dust removal capacity, it must be used combining a dust stripper like an electrostatic precipitator, for this reason has the problem that equipment will be enlarged.
[0004] Succeeding in this invention in view of such a point, the place made into the purpose has deodorization capacity in offering the deodorization equipment which equips the very high top also with dust removal capacity.
[0005]
[Means for Solving the Problem] While having the discharge section which has the discharge electrode to which a deer is carried out and this invention discharges by high-voltage impression, and a counter electrode, it has the description to have the ozone produced by discharge in the discharge section, heat, and the functional material which performs adsorption decomposition of gas constituents using at least one of ultraviolet rays.
[0006] It is desirable to have ventilation equipment which supplies air to the discharge space of the discharge section and the configuration space of a functional material. And the above-mentioned functional material may be arranged in the downstream of the discharge space of the discharge section, or may be arranged in throughout [discharge sky / of the discharge section]. In the case of the latter, it can fill up and arrange in throughout [discharge sky / which is surrounded with the electrode of the discharge section], and a granular thing is suitable for the functional material at this time, and it is desirable that ferroelectric ingredients, such as barium titanate, are blended or mixed.
[0007] It is desirable that may cover and arrange a functional material in the electrode wall surrounding the discharge space of the discharge section, and the enveloping layer by the functional material of an electrode wall has irregularity on that front face in this case. It is also desirable to cover to some electrode walls and to leave the exposure of an electrode. It may be covered and arranged in the

PAGE 30/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

electrode wall surrounding the discharge space of the discharge section while filling up with a functional material throughout [discharge sky / which is surrounded with the electrode of the discharge section].
[0008] Furthermore, as for a functional material, it is desirable that it is a deordorization decomposition catalyst, and at least two sorts of an ozone deodorization catalyst, a combustion oxidation catalyst, a photocatalyst, or combination of these can be used in this case. Functional materials may be adsorption material, such as a porosity ceramic, activated carbon, a zeolite, and clay, and may be the combination of adsorption material and a deordorization decomposition catalyst. Two or more sorts of functional materials may be arranged in a serial.
[0009] It is desirable honeycomb structure, a laminated structure, roll-like structure, or for the electrode surrounding the discharge space of the discharge section to presuppose that it is cylindrical.
[0010]
[Function] According to this invention, odor gas constituents are not electrochemically decomposed by discharge phenomena in the discharge section, such as corona discharge and plasma discharge, and adsorption decomposition of the odor gas constituents which was not decomposed by discharge is carried out with the ozone produced by the above-mentioned discharge, heat, and the functional material which performs adsorption decomposition of gas constituents using at least one of ultraviolet rays. And since dust is ionized by discharge, dust is collected to the counter electrode in the discharge section.
[0011] If it has ventilation equipment which supplies air to the discharge space of the discharge section, and the configuration space of a functional material, the positive air installation by ventilation equipment can raise throughput. Although the above-mentioned functional material may be arranged in the downstream of the discharge space of the discharge section, since the odor gas constituents by which adsorption maintenance was carried out with the functional material are decomposed by the subsequent discharge phenomenon when it arranges in throughout [discharge sky / of the discharge section], a throughput becomes high. In this case, although a functional material can arrange many functional materials by filling up and arranging in throughout [discharge sky / which is surrounded with the electrode of the discharge section], it can be efficient and can make adsorption decomposition of the gas constituents using at least one of maintenance of discharge, ozone and heat, and ultraviolet rays perform by supposing that it is granular in the clearance between particles. Moreover, a discharge phenomenon can be promoted if the functional material with which ferroelectric ingredients, such as barium titanate, were blended or mixed is used.
[0012] A functional material may be covered and arranged in the electrode wall surrounding the discharge space of the discharge section, and can aim at reduction of pressure loss in this case. Moreover, when the enveloping layer by the functional material of an electrode wall is what has irregularity on the front face, since airstream can be made to cause a turbulent flow, an efficient escape-of-gas reaction can be desired. If it covers to some electrode walls and leaves the exposure of an electrode, maintenance of a discharge phenomenon can be aimed at.
[0013] While filling up with a functional material throughout [discharge sky / which is surrounded with the electrode of the discharge section], you may make it cover a functional material to the electrode wall surrounding the discharge space of the discharge section. And when using the deordorization decomposition catalyst which consists of either an ozone deodorization catalyst, a combustion oxidation catalyst or a photocatalyst and such combination as a functional material, it shall have high escape-of-gas capacity. Functional materials may be adsorption material, such as a porosity ceramic, activated carbon, a zeolite, and clay, and can adsorb wide range gas constituents at this time. When each effectiveness by the functional material of both the above-mentioned kinds can be expected when a functional material is constituted from combination of adsorption material and a deordorization decomposition catalyst, and two or more more sorts of functional materials are arranged in a serial, gas constituents can be removed using the description of each functional material respectively.
[0014] When it considers as honeycomb structure, the electrode surrounding the discharge space of the discharge section can be made [of a throughput] high as compared with an occupancy tooth space while it can aim at improvement in discharge effectiveness. As compared with a mist beam occupancy tooth space, it can consider as the high thing of a throughput as a laminated structure or roll-like

structure, and in arranging a functional material in discharge space, when still more cylindrical, many functional materials can be arranged.

[0015]

[Example] If this invention is explained in full detail based on the example of illustration below, in drawing 1 or drawing 2 , one in drawing shows the discharge section which consists of a discharge electrode 2 and a counter electrode 3, and 3 shows the ozone produced by discharge in the discharge section, heat, and the functional material which performs adsorption decomposition of gas constituents using at least one of ultraviolet rays. The above-mentioned discharge sections 1 may be plate-like and a linear thing, although discharge of corona discharge, plasma discharge, etc. is produced between a discharge electrode 2 and a counter electrode 3 by impression of the high voltage and it is desirable that it is the tubed thing of the cross-section round shape surrounding a discharge electrode 2 thru/or a polygon as for a counter electrode 3. As for a discharge electrode 2, it is desirable that they are tabular or a line. If it is a conductive ingredient, although the quality of the material of these discharge electrodes 2 and a counter electrode 3 is good, stainless steel, a tungsten, etc. can be suitably used for it anything. When making a discharge electrode 3 cylindrical, although the thing of the arbitration of 2 can be used for the cross section of the space surrounded with this discharge electrode 3 0.01-10000mm, from the point of discharge nature, 2 is desirable [the cross section] 1-100mm. In addition, as for the exterior of the discharge section 1, it is desirable to secure safety by covering with the insulator which consists of the organic substance, such as inorganic substances, such as a silica, an alumina, and cordierite, or acrylic resin, ABS, and polystyrene.

[0016] It does not ask any of the shape of an interval or a pulse the electrical-potential-difference classes impressed between the discharge electrode 2 of the discharge section 1 and a counter electrode 3 are about an alternating current, a direct current, or these, but a discharge phenomenon should just be accepted. The distance between electrodes determines the height of the electrical potential difference to impress. The discharge by this discharge section 1 decomposes into the odorless or harmless matter various kinds of gas constituents which exist in throughout [discharge sky] by electrochemical radical reaction, such as plasma. But a part cannot demonstrate necessary deodorization capacity only by the discharge section 1, in order to remain by un-decomposing. A functional material 4 compensates this and performs decomposition removal of the gas constituents which remained, using positively the ozone produced by the discharge section 1, heat, and light.

[0017] As a functional material 4, adsorption material, such as a deordorization decomposition catalyst which is an ozone deodorization catalyst, a combustion oxidation catalyst, or a photocatalyst, and a porosity ceramic, activated carbon, a zeolite, clay, can be used. The ozone deodorization catalyst which is a deordorization decomposition catalyst made support support metallic oxides, such as a manganese dioxide, titanium oxide, and a zinc oxide, is generating active oxygen by decomposing ozone on the front face, and has the function which carries out decomposition removal of the odor gas constituents to which it stuck. the thing with which the combustion oxidation catalyst made support support metal support or metallic oxides, such as platinum, palladium, and a manganese dioxide, -- it is -- the amount of support -- 1 - 40% weight section -- a law -- the thing made to support with a method can be used. Catalytic activity is discovered and this combustion oxidation catalyst performs oxidative degradation of the odor gas constituents to which it stuck, when that temperature becomes 100-400 degrees C. Furthermore, a photocatalyst is what carried out distributed support of the metal oxide independent or the photosensitizer which mainly has photocatalyst activity, such as titanium oxide, a zinc oxide, and tin oxide, in the support of the sense at coincidence, and when ultraviolet rays are mainly received, oxidative degradation activity discovers it.

[0018] Even if it uses the deordorization decomposition catalyst of which class, it is generated when it is made to discharge in the discharge section 1, and ozone, heat, and ultraviolet rays are arranging in the discharge space of the discharge section 1 near the discharge section 1 for this reason, and present activity. The three above-mentioned sorts of deordorization decomposition catalysts can also be used combining at least two sorts, although it is independent and or may be used someday. discharge -- both ozone heat and light -- although -- since it is generated upwards and these yields cannot be controlled

PAGE 32/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

according to an individual, it becomes most advantageous to use together the three above-mentioned sorts of deordorization decomposition catalysts.

[0019] As a functional material, adsorption material, such as a porosity ceramic, activated carbon, a zeolite, and clay, can also be used as mentioned above. Although this adsorption material does not have a catalyst function like the above-mentioned deordorization decomposition catalyst in itself When it has been arranged in the discharge space of the discharge section 1 near the discharge section 1 and odor gas constituents are adsorbed, When it will expose to ozone, the heat, and light (ultraviolet rays) which are generated with these odor gas constituents in discharge upwards over a long period of time and is allotted in discharge space 1, in order to expose also to discharge, decomposition of odor gas constituents will be assisted. Since the range of the gas constituents to which it sticks is wide, especially adsorption material is advantageous when various kinds of gas constituents are mixed. Of course, you may use it combining this adsorption material and the above-mentioned deordorization decomposition catalyst.

[0020] And while arranging a functional material 4 near the discharge section 1, he forms ventilation equipment 5 and is trying for the air which passed the discharge section 1 to pass the arrangement section of a functional material 4 in what is shown in drawing 1 . Moreover, in what is shown in drawing 2 , while arranging a functional material 4 in throughout [discharge sky / of the discharge section 1], ventilation equipment 5 is formed. The ventilation equipment 5 in here is formed in order to raise throughput by performing air installation positively, and when installing this deodorization equipment in a part which serves as an airstream way from the first, it does not necessarily carry out the need.

[0021] In arranging a functional material 4 in discharge space 1, as shown in drawing 3 besides the restoration gestalt shown in drawing 2 , you may prepare in the wall of the counter electrode 3 surrounding the discharge space of the discharge section 1 as an enveloping layer. In the case of the former, many amounts of arrangement of a functional material 4 can be taken, and when it is the latter, the pressure loss by the functional material 4 can be reduced. As shown in drawing 6 , while being filled up with a functional material 4, it does not bar arranging also as an enveloping layer. Anyway, since being decomposed by the subsequent discharge phenomenon arises after adsorption maintenance of the gas constituents which remained without being decomposed by discharge is carried out with a functional material 4 when a functional material 4 is arranged in throughout [discharge sky / of the discharge section 1], a throughput becomes high.

[0022] When filling up with and arranging a functional material 4, it is desirable to make a functional material 4 granular and to make it a clearance generated between particles. It is because it is decomposed with the ozone which decomposition of the gas constituents by discharge was made in this clearance, and the gas constituents which remained were adsorbed on functional material 4 front face, and was produced in the decomposition and discharge by discharge for the second time, heat, and light. If the gestalten of a particle are configurations which can secure a clearance, such as the shape of a globular shape, a cylinder, and a ring, they are good anything. Although magnitude is based also on the magnitude of discharge space, it is 2-10mm preferably 1-30mm.

[0023] Since it is surely hard coming to generate a discharge phenomenon by restoration of a functional material 4, it is desirable to blend or mix ferroelectric ingredients, such as barium titanate, to a functional material 4. Although it comes out to apply the rate of a compounding ratio of the 0.1 sections of whole weight - 99.9 section when blending a ferroelectric ingredient with a functional material 4, it is desirable that it is the five sections from the point of the balance of a dielectric operation and adsorption disintegration - 90 section. When mixing a ferroelectric ingredient independent, the five sections - 90 section is desirable at a capacity factor.

[0024] Although thickness of an enveloping layer can be set to 0.1mm - 10mm when arranging a functional material 4 as an enveloping layer, it is required not to bar a discharge phenomenon. As the whole wall surface of a counter electrode 3 is shown in drawing 5 , without covering with a functional material 4, when it forms an enveloping layer only in a part and the remainder exposes a counter electrode 3, the above-mentioned thickness limit may be made loose. In addition, in coverage, 10% -

PAGE 33/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

99% is meant in a part of this case. If irregularity is prepared in the front face of the enveloping layer by the functional material 4 as shown in drawing 4 , since the passing airstream can be made to produce a turbulent flow, an efficient escape-of-gas reaction can be desired.

[0025] What is shown in drawing 7 forms a counter electrode 3 as a thing of the honeycomb configuration by which barrels were installed successively, and shows the discharge section 1 which has arranged the discharge electrode 2 in the center in each space. The cross-section configuration of a barrel may be not only a hexagon but a rectangular head, a trigonum, or a round thing. When it does in this way, by making discharge space small, it is advantageous to improvement in discharge effectiveness, and also a high throughput is demonstrated as compared with an occupancy tooth space. Drawing 10 forms a functional material 4 in the inside of each cel as an enveloping layer, and drawing 12 shows the case where discharge space is filled up while considering as the enveloping layer of the inside of a cel.

[0026] As shown in drawing 8 , also when it considers as roll-like structure or considers as a laminated structure, as compared with an occupancy tooth space, it can consider as the high thing of a throughput. Drawing 8 (b) shows the case where the enveloping layer of a functional material 4 is prepared in one side of the counter electrode 3 made into the shape of a roll. Drawing 9 shows what made the counter electrode 3 cylindrical. Next, a concrete example and the example of a comparison explain deodorization capacity.

- The discharge electrode 2 which takes the lead in the counter electrode 3 of one to example 1 bore 35mmphi and the shape of a cylinder made from stainless steel with a die length of 180mm from diameter 1mmphi and a tungsten wire with a die length of 120mm has been arranged, the discharge section 1 was constituted, and discharge was produced by impressing the electrical potential difference of 6kV of direct currents. Moreover, it was filled up with about 50 cc of ozone deodorization catalysts which bore 35mmphi and cylinder tubing made from a ceramic with a die length of 50mm were arranged [catalysts] for the ventilation equipment 4 of 12V drive between the discharge section 1 and ventilation equipment 4, and made the downstream of the discharge section 1 install a manganese dioxide with a mean particle diameter of 3.5mm on a front face in this by appearances.
- It replaced with the ozone deodorization catalyst in one to example 2 example 1-1, and what mixed 20 cc of granular active carbon with a mean particle diameter of 2mm with 30 cc for the combustion oxidation catalyst with a mean particle diameter of 2mm was used.
- The discharge electrode 2 which takes the lead in the counter electrode 3 of two to example 1 bore 28mmphi and the shape of a cylinder made from stainless steel with a die length of 150mm from diameter 0.7mmphi and a stainless steel line with a die length of 100mm has been arranged, the discharge section 1 was constituted, and discharge was produced by impressing the electrical potential difference of 10kV of alternating currents. Moreover, it was filled up with about 60 cc of ozone deodorization catalysts of the titania / silica base of 2mm of mean diameters in the counter electrode 3. The glass nonwoven fabric was arranged on the both-ends effective area of a counter electrode 3, and the leakage of a deordorization catalyst was prevented. Ventilation equipment 6 has been arranged to the downstream.
- It replaced with the ozone deodorization catalyst in two to example 2 example 2-1, and about ten cc of ozone deodorization catalysts containing the manganese dioxide of the titania / silica base of about 2mm of mean diameters and 40 cc [of barium titanate ceramics of 2mm of mean diameters] (ferroelectric) mixture was used. Moreover, applied voltage was set to 12kV.
- It replaced with the ozone deodorization catalyst in two to example 3 example 2-1, and it was filled up with 60 cc, after adjusting the ozone deodorization catalyst / barium titanate ceramics of 3mm of mean diameters blended so that the titania / silica base+2 manganese oxide of about 2mm of mean diameters, and barium titanate might become the 70 sections by the whole weight ratio and mixing. Moreover, applied voltage was set to 12kV.

[0027] About the above thing, 10 ppm ammonia gas was introduced under airflow the conditions for /of 1.0l., and gas removal efficiency was searched for by performing density measurement by the indicator tube by the deodorization equipment downstream. Gas removal efficiency was computed by gas-

PAGE 34/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

removal-efficiency (%) =(introductory concentration-down-stream concentration) x100-/installation concentration. A result is shown in Table 1. In addition, the example of a comparison of front Naka shows the case where it is made to deodorize only in the discharge section 1 about each example.

[0028]

[Table 1]

	アンモニアガス除去率 (%)
実施例 1-1	98.5
比較例 1-1	40.3
実施例 1-2	99.6
比較例 1-2	38.5
実施例 2-1	98.4
比較例 2-1	32.6
実施例 2-2	99.3
比較例 2-2	50.1
実施例 2-3	99.7
比較例 2-3	39.6

[0029] - The discharge electrode 2 which takes the lead in the counter electrode 3 of the shape of a cylinder made from stainless steel with a bore [three to example 1 / of 10mm] and a die length of 450mm from a stainless steel line with a diameter [of 1.2mm] and a die length of 180mm has been arranged, the discharge section 1 was constituted, and discharge was produced by impressing the electrical potential difference of 15kV of alternating currents. Moreover, the inside of a counter electrode 3 was coated with the manganese dioxide of the cordierite base by the thickness of 2mm, and the enveloping layer of an ozone deodorization catalyst was formed. The front face of this enveloping layer prepared the concavo-convex level difference of about 1mm by damaging using a file. Ventilation equipment 6 has been arranged to the downstream.

- While replacing the discharge electrode 2 in three to example 2 example 3-1 with what was formed by the stainless steel line with a diameter [of 1.0mm], and a die length of 150mm, applied voltage was considered as 11kV of alternating currents, and the concavo-convex level difference of about 1mm was prepared by damaging the front face of the enveloping layer of the ozone deodorization catalyst of counter electrode 3 inside using a file further.

- While replacing the discharge electrode 2 in three to example 3 example 3-1 with what was formed by the stainless steel line with a diameter [of 1.4mm], and a die length of 200mm, applied voltage was considered as 16kV of alternating currents, and the enveloping layer of counter electrode 3 inside was further formed by covering the manganese dioxide of the cordierite base with the thickness of 1mm. On the occasion of formation of this enveloping layer, the whole surface of counter electrode 3 inside was made not to be covered with carrying out addition baking of the organic substance, such as starch, into a coating agent.

[0030] About these examples 3-1, 3-2, and 3-3, 7 ppm hydrogen-sulfide gas was introduced under airflow the conditions for /of 1.0l., and gas removal efficiency was searched for by performing density measurement by the indicator tube by the deodorization equipment downstream. Gas removal efficiency was computed by gas-removal-efficiency (%) =(introductory concentration-down-stream concentration) x100-/installation concentration. A result is shown in Table 2. In addition, the example of a comparison of front Naka shows the case where it is made to deodorize only in the discharge section 1 about each example.

[0031]

[Table 2]

PAGE 35/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

JP,08-200834,A [DETAILED DESCRIPTION]

	[illegible] (%)
[illegible] 3-1	87.4
[illegible] 3-1	41.1
[illegible] 3-2	86.6
[illegible] 3-2	39.5
[illegible] 3-3	89.4
[illegible] 3-3	33.7

[0032] - The discharge electrode 2 which takes the lead in the counter electrode 3 of the shape of a cylinder made from stainless steel with a bore [example 4 / of 18mm] and a die length of 250mm from a stainless steel line with a diameter [of 1.0mm] and a die length of 160mm has been arranged, the discharge section 1 was constituted, and discharge was produced by impressing the electrical potential difference of 14kV of alternating currents. Moreover, the inside of a counter electrode 3 was coated with the manganese dioxide of the cordierite base by the thickness of 1mm, and the enveloping layer of an ozone deodorization catalyst was formed. Furthermore, it was filled up with about 40 cc of ozone deodorization catalysts with a mean particle diameter [of the same presentation] of 2mm in the counter electrode 3. The glass nonwoven fabric was arranged on the both-ends effective area of a counter electrode 3, and the leakage of a deordorization catalyst was prevented. Ventilation equipment 6 has been arranged to the downstream.

- The discharge electrode 2 which takes the lead in the counter electrode 3 of the shape of a cylinder made from stainless steel with a bore [five to example 1 / of 18mm] and a die length of 240mm from a stainless steel line with a diameter [of 1.2mm] and a die length of 150mm has been arranged, the discharge section 1 was constituted, and discharge was produced by impressing the electrical potential difference of 18kV of alternating currents. Moreover, the inside of a counter electrode 3 was coated with the manganese dioxide of the cordierite base by the thickness of 1mm, and the enveloping layer of an ozone deodorization catalyst was formed. Furthermore, 40 cc of barium titanate ceramics which are the ferroelectrics of 2mm of mean diameters, and ten cc (2mm of mean diameters) of photocatalyst porcelain which coated titanium oxide were mixed, and it was filled up in the counter electrode 3. The glass nonwoven fabric was arranged on the both-ends effective area of a counter electrode 3, and the leakage of a deordorization catalyst was prevented. Ventilation equipment 6 has been arranged to the downstream.

- The discharge electrode 2 which takes the lead in the counter electrode 3 of the shape of a cylinder made from stainless steel with a bore [five to example 2 / of 16mm] and a die length of 200mm from a stainless steel line with a diameter [of 1.5mm] and a die length of 170mm has been arranged, the discharge section 1 was constituted, and discharge was produced by impressing the electrical potential difference of 16kV of alternating currents. Moreover, the inside of a counter electrode 3 was coated with the adsorption material of the zeolite base by the thickness of 1mm. Moreover, 30 cc of barium titanate ceramics which are the ferroelectrics of 2mm of mean diameters, and 20 cc (2mm of mean diameters) of photocatalyst porcelain which coated titanium oxide were mixed, and it was filled up in the counter electrode 3. The glass nonwoven fabric was arranged on the both-ends effective area of a counter electrode 3, and the leakage of a deordorization catalyst was prevented. Ventilation equipment 6 has been arranged to the downstream.

[0033] About these examples 4, 5-1, and 5-2, 13 ppm trimethylamine gas was introduced under airflow the conditions for /of 2.0l., and gas removal efficiency was searched for by performing density measurement by the indicator tube by the deodorization equipment downstream. Gas removal efficiency was computed by gas-removal-efficiency (%) =(introductory concentration-down-stream concentration) x100-/installation concentration. A result is shown in Table 3. In addition, the example of a comparison of front Naka shows the case where it is made to deodorize only in the discharge section 1 about each example.

PAGE 36/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

[0034]
[Table 3]

	トリメチルアミンガス除去率 (%)
実施例4 比較例4	87.9 39.1
実施例5-1 比較例5-1	89.0 40.3
実施例5-2 比較例5-2	90.3 38.6

[0035] - Example 6-1 cel inside dimension constituted the counter electrode from performing about 0.2mm coating for the cel inside of the honeycomb structure object made from cordierite with about 5mm angle and 20 cels with a die length of 100mm with a platinum paste, and formed the ozone deodorization catalyst which became irregularity to the inside further by the thickness of about 0.2mm. The discharge electrode has been arranged to the core of each cel using a 0.5mmx80mm stainless steel line, and impressed the electrical potential difference of 14kV of alternating currents between the discharge electrode and the counter electrode. Ventilation equipment has been arranged to the downstream.

- As shown in example 6-2 drawing 11 , cel inside dimension constituted the counter electrode 3 from performing about 0.2mm coating for the cel inside of the honeycomb structure object made from cordierite with about 5mm angle and 20 cels with a die length of 100mm with a platinum paste, and the barium titanate layer used as roughness and fineness as further shown in the inside at drawing 5 was formed by the thickness of about 0.5mm at the 100mm of the cel die-length directions. Moreover, the counter electrode 3 was constituted from cel inside dimension performing about 0.2mm coating for the cel inside of the honeycomb structure object made from cordierite with about 5mm angle and 20 cels with a die length of 100mm to the downstream with a platinum paste, and the ozone deodorization catalyst bed which makes a manganese dioxide a main catalyst at this inside was formed. In addition, both the above-mentioned counter electrodes 3 and 3 were connected electrically. In the cel of the upstream, the discharge electrode 2 which consists of a 0.5mmx80mm stainless steel line has been arranged at the core of each cel. Between the discharge electrode 2 and the counter electrode 3, the electrical potential difference of 16kV of alternating currents was impressed. Ventilation equipment has been arranged to the downstream.

- As shown in example 6-3 drawing 11 , cel inside dimension constitutes a counter electrode 3 from performing about 0.2mm coating for the cel inside of the honeycomb structure object made from cordierite with about 5mm angle and 20 cels with a die length of 100mm with a platinum paste. The functional material (a manganese dioxide / barium titanate / inorganic material a weight ratio about 3/the ozone deodorization catalyst / ferroelectric layer blended by three fourths) used as roughness and fineness as furthermore shown in the inside at drawing 5 was formed by the thickness of about 0.2mm at the 100mm of the cel die-length directions. Moreover, the counter electrode 3 was constituted from cel inside dimension performing about 0.2mm coating for the cel inside of the honeycomb structure object made from cordierite with about 5mm angle and 20 cels with a die length of 100mm to the downstream with a platinum paste, and this inside was coated with the functional material (combustion oxidation catalyst which used a manganese dioxide, platinum, etc. as the principal component) of a class different from the above-mentioned functional material. In addition, both the above-mentioned counter electrodes 3 and 3 were connected electrically. In the cel of the upstream, the discharge electrode 2 which consists of a 0.5mmx80mm stainless steel line has been arranged at the core of each cel. Between the discharge electrode 2 and the counter electrode 3, the electrical potential difference of 15kV of alternating currents was impressed. Ventilation equipment has been arranged to the downstream.

- as the functional material of the upstream in six to example 4 example 6-3 -- a manganese dioxide /

PAGE 37/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

activated carbon / inorganic material -- a weight ratio -- about 5 -- the adsorption material which uses activated carbon as a principal component was used as a functional material of the downstream using the blended ozone deodorization catalyst / adsorption layer out of which /3/2 came comparatively.
[0036] About these examples 6-1 to 6-4, two cigarettes (mild seven) were burned under airflow the conditions for /of 1.6l., the sidestream smoke was introduced, and the organoleptics by ten panelists who have the normal sense of smell by the deodorization equipment downstream were performed. the appraisal method was enforced based on the six-step odour strength notation (0: -- no odor and 1: -- 2: sensed faint -- 3: sensed a little strong -- 4: sensed strong -- 5: sensed very strong -- it feels extremely strongly). Moreover, an ozone level and anion concentration were also measured to coincidence. A result is shown in Table 4. In addition, the example of a comparison of front Naka shows the case where it is made to deodorize only in the discharge section 1 about each example.
[0037]
[Table 4]

	[illegible] (平均個)	[illegible] (ppm)	[illegible] (個/cc)
[illegible] 6-1	0.3	0.0	12000
[illegible] 6-1	2.5	0.3	10500
[illegible] 6-2	0.2	0.0	13000
[illegible] 6-2	3.1	0.4	10900
[illegible] 6-3	0.4	0.0	12500
[illegible] 6-4	0.1	0.0	12000
[illegible] 6-3、4	4.0	0.2	10000

[0038] - What coated the both sides of the polyester layer of a seven to 10.1 mm example with the aluminum layer used as a counter electrode by 0.05mm thickness was made into the scroll type whose diameter is about 50mm and whose die-length direction is about 100mm, and the discharge electrode which consists of a 0.5mmx80mm tungsten wire in an inside-and-outside layer has been arranged at intervals of about 25mm. Moreover, the barium-titanate-ceramics particle of about 1.5mm of mean diameters has been arranged in discharge space. In order to prevent the leakage of a particle in scrolling both ends, the nonwoven fabric made from glass fiber has been arranged, and ventilation equipment has been arranged to the downstream.
- The ozone deodorization catalyst particle with a mean particle diameter of about 2.0mm has been arranged in the discharge space in seven to example 2 example 7-1.
- Activated carbon / ozone deodorization catalyst particle with a mean particle diameter of about 1.8mm have been mixed and arranged with three fifths of mixing ratios in the discharge space in seven to example 3 example 7-1.
[0039] About these examples 7-1 to 7-3, two cigarettes (mild seven) were burned under airflow the conditions for /of 1.3l., the sidestream smoke was introduced, and the organoleptics by ten panelists who have the normal sense of smell by the deodorization equipment downstream were performed. The appraisal method was enforced based on the above-mentioned six-step odour strength notation. A result is shown in Table 5. In addition, the example of a comparison of front Naka shows the case where it is made to deodorize only in the discharge section 1 about each example.
[0040]
[Table 5]

PAGE 38/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

	[illegible] (平均値)
[illegible] 7-1	0.2
[illegible] 7-2	0.3
[illegible] 7-3	0.3
[illegible] 7	4.0

[0041]
[Effect of the Invention] As mentioned above, in this invention, adsorption decomposition of the odor gas constituents which was not decomposed by discharge is carried out with the ozone produced by the above-mentioned discharge, heat, and the functional material which performs adsorption decomposition of gas constituents using at least one of ultraviolet rays by odor gas constituents not being electrochemically decomposed by discharge phenomena in the discharge section, such as corona discharge and plasma discharge, and very high deodorization capacity is demonstrated [for this reason]. And since dust is ionized by discharge and dust is collected to the counter electrode in the discharge section, generating of an anion which can also expect a dust-removing function above and is made good for the health of the body by discharge is also expectable.
[0042] When it shall have ventilation equipment which supplies air to the discharge space of the discharge section, and the configuration space of a functional material, throughput can be made high by positive air installation by ventilation equipment. Since it can also expect that the odor gas constituents by which adsorption maintenance was carried out with the functional material will be decomposed by the subsequent discharge phenomenon when the above-mentioned functional material is arranged in the downstream of the discharge space of the discharge section, it becomes the thing which can be made to discharge easily and a functional material is arranged in throughout [discharge sky / of the discharge section], while being able to make a throughput still higher, it can collect into a compact. In this case, a functional material is being able to arrange many functional materials by filling up and arranging in throughout [discharge sky / which is surrounded with the electrode of the discharge section], and supposing especially that it is granular. While it can be efficient and being able to make adsorption decomposition of the gas constituents using at least one of maintenance of discharge, ozone and heat, and ultraviolet rays perform in the clearance between particles, in order that contacting efficiency may improve, the engine performance can be raised also in this point. Moreover, if the functional material with which ferroelectric ingredients, such as barium titanate, were blended or mixed is used, since a discharge phenomenon can be promoted, the problem produced by having been filled up with the functional material in discharge space can be reduced.
[0043] A functional material may be covered and arranged in the electrode wall surrounding the discharge space of the discharge section, and can aim at reduction of pressure loss in this case, and also it can prevent the problem of the powder omission of a functional material. Moreover, when the enveloping layer by the functional material of an electrode wall is what has irregularity on that front face, in order that this irregularity may make airstream cause a turbulent flow, contact to a functional material and airstream will increase and the engine performance improves. If it covers to some electrode walls and leaves the exposure of an electrode, maintenance of a discharge discharge phenomenon can be made easy in spite of existence of an enveloping layer.
[0044] And although either an ozone deodorization catalyst, a combustion oxidation catalyst or a photocatalyst can be used, when using the deordorization decomposition catalyst which consists of such combination as a functional material, it has higher escape-of-gas capacity. When adsorption material, such as a porosity ceramic, activated carbon, a zeolite, and clay, is used as a functional material, wide range gas constituents can be adsorbed. Since gas constituents can be removed using the description of each functional material respectively when the engine performance improves further and two or more

PAGE 39/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06

more sorts of functional materials are arranged in a serial, since each effectiveness by the functional material of both the above-mentioned kinds can be expected when a functional material is constituted from combination of adsorption material and a deordorization decomposition catalyst, nearly perfect deodorization can be performed by the one pass.

[0045] The electrode surrounding the discharge space of the discharge section can be made [of a throughput] high as compared with an occupancy tooth space, while being able to aim at improvement in honeycomb structure, then discharge effectiveness. As compared with a mist beam occupancy tooth space, it can consider as the high thing of a throughput as a laminated structure or roll-like structure, and in arranging a functional material in discharge space, when still more cylindrical, many functional materials can be arranged.

[Translation done.]

PAGE 40/49 * RCVD AT 7/5/2005 6:21:57 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:+703 905 2500 * DURATION (mm-ss):16-06